Ministry of Education

Futures Language schools

FUTURES EDUCATIONAL SYSTEMS

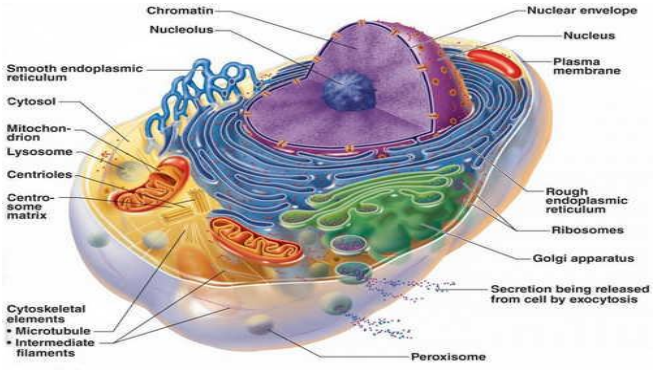
(*Biology* Notebook)

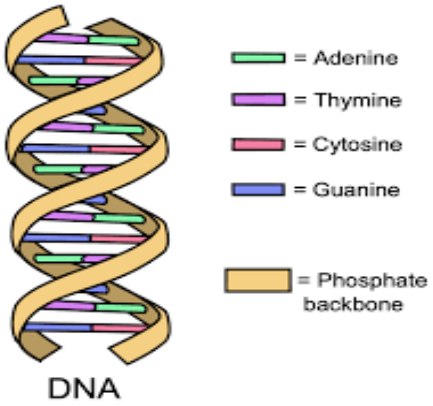
1st Secondary Grade

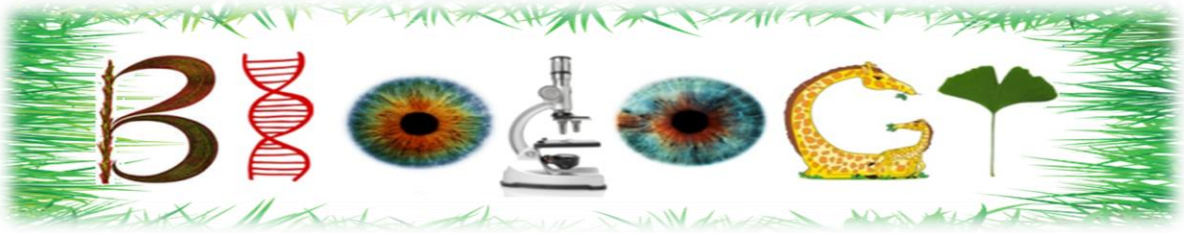
First Term

STUDENT NAME : .....

Class : .....







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Unit One (Lesson (1) Chemical structure of living organisms &Carbohydrates)

Living organisms' bodies consist of:
Systems → Organs → Tissues → Cells→ Cellular organelles

Cells of living organisms consist of **organic molecules** and **inorganic molecules.**

Organic molecules as carbohydrates, lipids, proteins, and nucleic acids. They are big molecules containing hydrogen and carbon basically
known as "**Biological macromolecules"**

Inorganic molecules as water and salts, which may contain carbon or not.

Biological macromolecules:

They are large biological molecules (P**olymers)** composed of smaller molecules called "**monomers".** Monomers bind together by a process called **"polymerization process"**

Carbohydrates

Their general formula is $(CH_2O)_n$ (**In at a ratio 1:2:1 respectively)**

Importance of carbohydrates:-

1- The main and quickest source of energy in living organisms

2- Store energy in living organisms, (plants store carbohydrates as **starch**, whereas animals and humans store them as **Glycogen** in liver and muscles

3- The basic component of some parts of cell such as **cellulose** in the cell walls of plant cells.

The molecular structure of carbohydrates

Carbohydrates are divided according to their structures into:-

I. Simple sugars:-

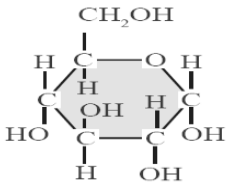
Common properties of simple sugars:-

1- Soluble in water
2- They have small molecular weights
3- They have a sweet taste

A. Monosaccharides:

Examples:

1- Glucose (Grapes sugar) 2- Fructose (Fruits sugar) 3- Ribose



B. Disaccharides:

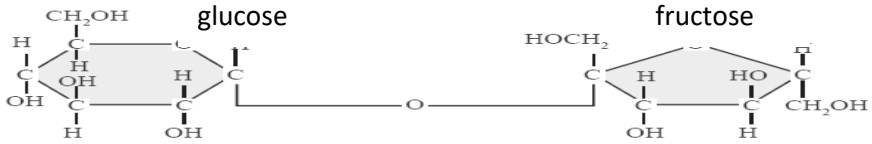
Structure: Two molecules of monosaccharides bound together

Examples:-

1- Sucrose (sugar cane): It consists of glucose molecule bound with fructose one

2- Lactose (milk sugar): It consists of glucose molecule bound with galactose one

3- Maltose (malt sugar): It consists of two bound glucose molecules



Monosaccharides role in energy transfer processes inside living organisms:-

Living organisms release the energy stored in monosaccharides as the following:-

1- Glucose is oxidized inside **mitochondria** in cells

2- The energy stored in glucose gets released in the form of chemical bonds

3- These chemical bonds are stored in compounds called **Adenosine Triphosphate (ATP)**

4- ATP transports to all parts of cell using its stored energy in all biological processes in cell

How to detect simple sugars in food

- We can detect simple sugars in food by using **Benedict reagent,** simple sugars change the colour of this reagent from **blue** to **orange**.

II. Complex sugars:-

Common properties of simple sugars:-

1- Insoluble in water 2- They have heavy molecular weights

3- They don't have any taste

Examples:- 1- Cellulose 2- Starch 3- Glycogen

How to detect starch in substances:

Starch changes the colour of **iodine solution** to **blue**

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→ Choose the correct answer :

1- The molecules which don't contain carbon atoms are ……molecules.
   a) Carbohydrates b) lipid c) water d) protein

2- Which of the following is not an organic biological molecule?
   a) Nucleic acid b) carbohydrates c) water d) protein

3- The general formula $(CH_2O)_n$ indicates ……
   a) Fats b) proteins c) cholesterol d) carbohydrates

4- The sugars which is known as malt sugar is ……..
   a) Maltose b) sucrose c) lactose d) galactose

5- All the following carbohydrates are soluble in water except ……
   a) Glycogen b) sucrose c) glucose d) fructose

6- When two molecules of glucose are combined together……is formed.
   a) Lactose b) maltose c) ribose d) sucrose

7- From the example of disaccharides is the …….
   a) Glucose b) fructose c) galactose d) sucrose

8- Which of the following is not a polysaccharide?
   a) Starch b) glycogen c) cellulose d) sucrose

9- The sugars that are responsible for energy production process inside the cells of living organisms are …….
   a) Monosaccharides b) disaccharides c) complex sugar d) simple sugar

10- From the example of polysaccharides is …….
   a) Cellulose b) sucrose c) maltose d) lactose

11- Glycogen consists of…….. molecules.
   a) Fructose b) glucose c) galactose d) ribose

12- Benedict's reagent is used for detecting ……..
   a) Glucose b) sucrose c) starch d) cellulose

13- Iodine solution is used for detecting …….
   a) Glucose b) sucrose c) starch d) Cellulose

14- Carbohydrates are stored in the cells in the form of ……..
   a) Cellulose b) glycogen c) starch d) glucose

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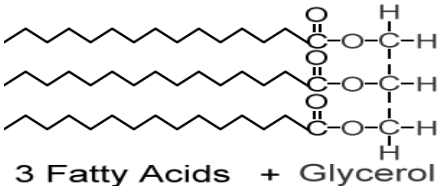
(Lesson (2) Lipids)

simple lipids (fats, waxes, oil) , complex lipids (phospholipids) and derivative lipids (steroids)

→ Lipids dissolve in non-polar solvents such as **carbon tetrachloride** and **benzene,** but don't dissolve in polar solvents such as **water**

The molecular structure of lipids

Lipids are formed from 3 fatty acids bound to a glycerol molecule **(glycerol is an alcohol having 3 hydroxyls OH groups)**



The importance of lipids

1- **A source of energy:** The energy released from lipids is more than that released from carbohydrates. Human body begins releasing energy from lipids when it runs out of carbohydrates.
2- cell membranes.
3- Some animals (polar bears, penguins, seals) store lipids under their skins to protect them from low temperatures.
4- Some of them (steroids) work as hormones

The classification of lipids

I. Simple lipids:-

a. Oils (Triglycerides)

Some birds' feathers are covered with oils to protect them from water which disable their movement.

b. Fats (Glycerides)

c. Waxes

Wax covers the leaves of plants (especially desert plants) to decrease water lose by transpiration.

II. Complex lipids:-

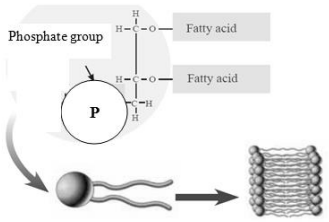
They are formed from oxygen, hydrogen, carbon, sulphur, and phosphorus.

Examples:-

Phospholipids: Lipids which occur in the membranes of plant and animal cells.

III. Derivative lipids:-

They are lipids which are derived from complex and simple lipids by **"Hydrolysis process"**



Examples:-

1- Cholesterol 2- Hormones 3- Steroids

How to detect lipids in substances

Sudan IV reagent is used to detect lipids, as lipids can dissolve in it which changes its colour to red.

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→ Choose the correct answer:

1- Which of the following molecules consists of glycerol & fatty acids?
a) Sugars b) Starch c) Lipids d) Nucleic acids

2- Which of the following structures contain nitrogen & phosphorus in its composition?
a) Starch b) Oils c) Cell membrane d) Haemoglobin

3- All the following are from lipids except …….
a) Waxes b) Cholesterol c) Steroids d) Fibers

4- Lipids represents …… % of the organic material in the living cell.
a) 5 b) 15 c) 25 d) 35

5- Substances that formed by reaction of saturated fatty acids with glycerol is …….
a) Oils b) Waxes c) Fats d) Cholesterol

6- From the example of lipids that work as hormones are ……..
a) Phospholipids b) Steroids c) Fats d) Waxes

7- Which of the following are produced of reaction between fatty acids with alcohols? ……
a) Simple lipids b) Complex lipids c) Lipid derivatives d) Hormones

8- From the examples of complex lipids are ……
a) Fats b) Phospholipids c) Oils d) Waxes

9- The liquid lipids that are formed by the reaction of unsaturated fatty acids with glycerol are ……
a) Oils b) Fats c) Waxes d) Cholesterol

10- The phospholipids are formed by replacing the ……..fatty acid of the fat molecule by a phosphate group & choline group.
a) First b) Second c) Third d) Fourth

11- From the examples of lipid derivatives are the ……
a) Steroids b) Phospholipids c) Fats d) Waxes

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(Lesson (3) Proteins)

The importance of proteins

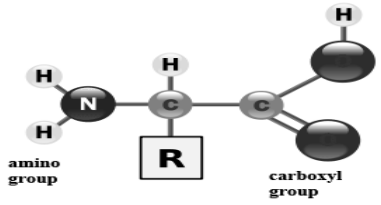
1 - The basic component of cell membranes, ligaments and tendons
2 - They form muscles, fingernails, hair, organs, glands
3- They form liquids in human body such as lymph and blood
4- They are necessary for human growth
5- The main component of chromosomes
6- They form enzymes and hormones
7. They form hooves and horns of animals, and spider webs

The molecular structure of proteins

Polymers of proteins are composed of monomers called "**amino acids"**

Amino acids:

Structure: An amino acid is composed of a carbon atom linked with:-
An acidic functional group called amine NH_2
A basic functional group called carboxyl COOH
R Group (side group) which differs according to the type of amino acid



General structure of an α - amino acid

Amino acids and building proteins

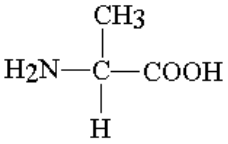
Proteins are formed from groups of amino acids linked together by **peptide bonds**

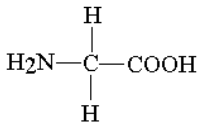
Peptide bond: A bond between two molecules which is formed when the carboxyl group of an amino acid reacts with the amine group in another one releasing water molecule (H_2O)

- Two amino acids linked by peptide bond are called **"dipeptide",** while a protein chain formed from many amino acids linked by peptide bonds is called "**polypeptide"**

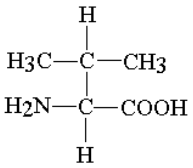
- Proteins are formed from the same 20 amino acids, but with different arrangements.

Example of amino acids:-





glycine



valine

The classification of proteins

Proteins are classified according to their structure into:-

I. **Simple proteins:** They consist of only amino acids

Examples: Albumin, which is found in blood plasma, leaves and seeds of plants

II. **Associated proteins:-**

Structure: They consist of amino acids associated with other elements.

Examples:-

1- Nuclear-associated proteins:

2- Phosphoproteins**:** They contain phosphorus element (ex. Casein – milk protein)

3- Thyroxin: Hormone secreted by thyroid gland and contains iodine element.

4- Blood hemoglobin: Its protein contains iron element.

How to detect proteins in substances

By using **Biuret reagents**, proteins change the colours of these reagents from **blue** to **purple**

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→ Choose the correct answer:

1- The ……is (are) from examples of amino acids.
   a) Alanine b) Fibrinogen c) Glycine d) (a) and (c)

2- Which of the following is not a function of proteins?
   a) Maintaining and transmission of genetic information
   b) Controlling the rate of reaction
   c) Movement of materials inside & outside the cells
   d) Resistance of diseases

3- Molecules with functional groups COOH and NH_2 can form polymers by dehydrogenation reaction through formation of……. bond.
   a) Hydrogen b) Covalent c) Peptide d) Ionic

4- Albumin protein is found in ……..
   a) Plant's root b) Plant's leaf c) Human plasma d) All the previous

5- Biuret's reagent is used to detect……..
   a) Simple sugars b) Lipids c) Starch d) Proteins

6- From the examples of phosphoproteins is the ……..
   a) Casein b) Albumin c) Haemoglobin d) Thyroxine

7- Amino acids differ among themselves in respect of ……
   a) Carboxyl group
   b) amino group
   c) Alkyl group (R)
   d) All the previous

8- From the examples of simple proteins is ……
   a) Casein b) Albumin c) Haemoglobin d) Thyroxine

9- If a person suffers from pallor in face and increasing in rate of heartbeats and the doctor asked him to perform a blood test. Then it is found there is a deficiency in substance (X) and the doctor diagnosed him as he suffers from anemia. What type of medication the doctor will give him?
   a) A medication containing sodium element
   b) A medication containing zinc element
   c) A medication containing iron element
   d) A medication containing potassium element

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(Lesson (4) Nucleic Acids)

- Ribonucleic acid (RNA)
- Deoxyribonucleic acid (DNA)

Nucleic acids consist of structural units called "**nucleotides"** which are bound together by covalent bonds forming **polynucleotides**

Nucleotides:-

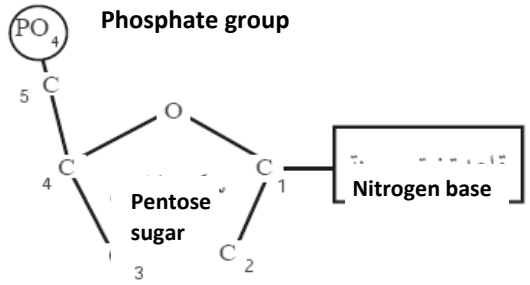
The building units of nucleic acids, each one of them is composed of three units which are:-

- Pentose (5 carbon) sugar:

There are two types of pentose sugar:-

Ribose: forms RNA

Deoxyribose: forms DNA



- Phosphate group

Linked by a covalent bond to the fifth carbon atom of the sugar molecule of the nucleic acid.

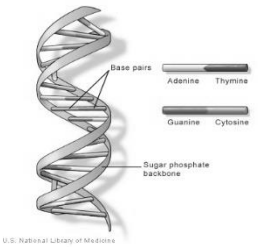
- **Nitrogenous base**

There are five nitrogenous bases which are:-

- Adenine (A) - Thymine (T) (**Uracil (U) in RNA molecules**) - Cytosine (C) - Guanine (G)

Each base links with the 1st carbon atom of sugar molecule by a covalent bond.

Nucleic acids differ according to their kind of pentose sugars and nitrogenous bases



The importance of DNA

1- Enter in the structure of chromosomes.
2- It is responsible for transferring hereditary traits through generations.
3- It carries the hereditary information responsible for the characteristics of living organisms and organization of the biological processes within cells.

Structure of DNA

→ DNA molecule consists of two strands coiled around each other.

→ Guanine base binds to Cytosine base with triple hydrogen bond.

→ Thymine base bind to Adenine base with double hydrogen bond

The importance of RNA

It is transcribed (copied) from DNA , then moves to cytoplasm to be used in making proteins which are responsible for the hereditary traits and organization of biological processes.

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Choose the Correct answer

1- The macro-molecules containing carbon , hydrogen , oxygen , nitrogen and phosphorus are the…….

a) Proteins b) Lipids c) Carbohydrates d) Nucleic acids

2- The sugar that enters in the structure of RNA is considered from……

a) Polysaccharides b) Monosaccharides c) Disaccharides d) (b)&(c)

3- What unique ability does DNA have , because it's a double-stranded ?

a) It serves as genetic material in all viruses.
b) It can move around the cells.
c) It can serve as a template for its own copying.
d) None of the above.

4- The nitrogenous base that doesn't exist in RNA is…….....

a) Adenine b) Cytosine c) Uracil d) Thymine

5- Which of the following is not a monomer?

a) Glucose b) Amino acid c) Nucleotides d) Protein

6- When a student examined the genetic material of a certain virus he found that its formed of single strand of nucleotides containing……..

a) Thymine base only.
b) Uracil base only.
c) Cytosine and thymine bases.
d) Uracil and cytosine bases.

7- Nucleic acids are composed of…….

a) Glucose b) Fatty acids c) Amino acids d) Nucleotides

8- A human cell containing a length of DNA that carries the code for making…….

a) Fat b) Glycogen c) Starch d) Lipase enzyme

9- Which of the following statements is correct?

a) Simple sugar is composed of polysaccharides.
b) Nucleotides are composed of nucleic acids.
c) Glycerol is composed of fatty acids.
d) Protein is composed of amino acids.

10- All these nitrogenous bases are found in DNA except……

a) Cytosine b) Thymine c) guanine d) uracil

11- The phosphate group of a nucleotide is connected to the carbon atom no. ……. of the sugar.

a) 1 b) 2 c) 3 d) 5

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Lesson (5) Chemical reactions inside organisms bodies

Metabolism: A group of biochemical reactions which occur within living organisms in order to build complex macromolecules from simple molecules or break up molecules to get energy.

Metabolism reactions are divided into:-

Anabolism: A process by which simple molecules are used to build complex macromolecules consuming energy.
e.g.: Building proteins from amino acids

Catabolism: A process by which energy is being released from the chemical bonds in some molecules such as glucose.
e.g.: Cells break up glucose to release energy .

Enzymes are proteins formed from groups of amino acids which are arranged in the form of polypeptide chains which forms the stereoisomerism of enzymes. They decrease high activation energy needed for chemical reactions . Act as a catalyst to speed up the reactions

Activation energy: The minimum energy required for a chemical reaction to occur.

Enzymes: Biological catalysts formed from proteins molecules which speed up chemical reactions occurring within living organisms.

The properties of enzymes

1- Act as catalysts, as they only speed up the chemical reaction without taking part in it.

2- They are affected by the concentration of hydrogen ions (pH) and temperature.

3- They are specific in their action, as every enzyme is specialized for only one reactant substance (**called substrate**)

4- They decrease the activation energy needed for chemical reactions to occur.

N.B:

Substrate: The substance on which enzyme work.

N.B:

Each enzyme a has an **active site** which is the place where the substrate can bind with the enzyme during the reaction forming enzyme-substrate complex

Factors affecting the work of enzymes

1- Temperature

- Every enzyme has a different optimum temperature (the temperature on which the enzyme becomes most active).
- When the temp. of an enzyme becomes less than its optimum temperature, its activity also decreases gradually. Enzyme activity stops at 0◦C (but it become active again when its temperature increases).

2- Power of hydrogen (pH)

- Solutions with pH less than 7 are acidic, while those with pH more than 7 are alkaline. Solutions with pH equals 7 are neutral.

PH and the activity of enzymes

- Enzymes are affected by pH because they are composed of amino acids which contain acidic carboxyl groups COOH and basic amine groups NH_2.

Examples - Pepsin enzyme works at acidic pH (less than 7)
- Trypsin enzyme works at basic pH (more than 7)

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2- Choose the correct answer:

1- How does the enzyme increase the speed of chemical reaction?
   a) By lowering the activation energy.
   b) By increasing the activation energy.
   c) By absorbing energy.
   d) By releasing energy.

2- Oxidation of glucose during cellular respiration is considered a process of…….
   a) Catabolism b) anabolism c) digestion d) excretion

3- Enzymes are characterized comparing to other chemical catalysts by that they…….
   a) Increase the activation energy.
   b) Are specific for a certain substrate.
   c) Participate in the chemical reaction.
   d) Increase the speed of chemical reaction.

4- The ……..is the process of releasing the energy stored in the chemical bonds of some molecules.
   a) Anabolism b) catabolism c) excretion d) digestion

5- Enzymes are composed of ……..substances.
   a) Protein b) fatty c) sugary d) starchy

6- Enzymes activity stops completely at temperature of ……. °C.
   a) Zero b) 25 c) 37 d) 40

7- Most enzymes work more active at temperature……..°C.
   a) 25 b) 37 c) 45 d) 60

8- From the factors that effect on the enzyme action is…….
   a) Temperature b) hydrogen power c) substrate concentration d) all the previous

9- Most enzymes work at hydrogen potential equal……
   a) 3.4 b) 5.4 c) 7.4 d) 9.4

10- Trypsin enzyme works efficiently at pH=……
   a) 8 b) 7.4 c) 2.5 d) 6

11- Pepsin enzyme works efficiently at pH =…….
   a) 7.4 b) 8 c) 1.5 d) 10

12- Enzymes acts on…….

a) Increasing the speed of chemical reaction
b) Decreasing the activation energy
c) Decreasing the consumption of more energy
d) All the previous

13- The value of hydrogen power is less than 7, the solution is……..

a) Acidic b) alkaline c) neutral d) amphoteric

14- Some plants digest insects and use the nutrients for growth. What must these plants produce to digest the insects?

a) Acids b) alkalis c) enzymes d) hormones

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Unit 2 Lesson 1 The Cell theory

Cell: The building unit of living organisms which can carry out all vital processes.
Cells have different shapes which are suitable for their functions, for example:

Nerve cells (neurons):-

Neurons are long to be able to send messages from the spinal cord (in the vertebral column) to all body parts.

Muscle cells:

They are long cells with cylinder shape which form muscle tissues. They have the ability to contract and relax to be able to move.

The discovery of the cell:

- **Robert Hook:** discovered cell
- **Van Leeuwenhoek:** examine blood.
- **Matthias Schleiden:** discovered that all plants consist of cells.
- **Theodor Schwann:** discovered that all animal consist of cells
- **Rudolf Virchow:** the cell, is the building unit of living organisms, is also a unit of function.

The cellular theory

1. All living organisms are composed of one or more cells.
2. The cell is the basic unit of structure, function, and organization in all organisms
3. All cells are generated from pre-existing cells through division.

Light microscope:

A microscope which works by artificial light and sunlight with magnification power of X1500

The magnification power of light microscope = Magnification power of eyepiece x magnification power of objective lens

Electronic microscope:

- A microscope which works by beams of electrons controlled by electromagnetic lenses instead of light, it has magnification power of X1,000,000
- Electronic microscope is better than light microscope because:-

It gives clearer magnified photos with high differentiation due to the short wavelength of electronic beams.

It receives the magnified photos of bodies on fluorescent screen or very sensitive photo screen

Kinds of electronic microscopes

1- Scanning electronic microscope: *Used to study the cell surface*

2- Transmission electronic microscope: *Used to study the internal structure of cell*

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- Choose the correct answer:

1- The scientist who discovered the cell was……..
   a) Robert Hooke B) Van Leeuwenhoek c) Schleiden d) Schwann

2- The cells of living organism's body are different in…….
   a) Shape b) size c) structure d) all the previous

3- The contrasting power of electron microscope is……..
   a) High b) very high c) low d) very low

4- Multicellularity occurs in……
   a) Animals only b) plants only c) animals and plants d) plants and amoeba

5- The first scientist who observed the world of microscopic organisms and living cells was……...
   a) Robert Hooke B) Van Leeuwenhoek c) Schleiden d) Virchow

6- The biggest cell in size is……cell.
   a) Unfertilized egg b) bacteria c) nerve d) muscular

7- A researcher examined a specimen containing red blood cells to study the components of them in the case of sickle cell anemia by using a microscope whose magnifying power is about 8900x. What is the type of microscope that he used?
   a) Light microscope.
   b) Fluorescence microscope.
   c) Transmission electron microscope.
   d) Scanning electron microscope.

8- When examining a thin slice of onion under the microscope ,with which power objective can I use ?
   a) High b) low c) 100x d) it doesn't matter which objective

9- Which statement(s) is(are) a part of the cell theory?
   a) All cells come from pre-existing cells.
   b) Human beings are multi cellular.
   c) Eukaryotes are made up of cells that are grouped in clusters.
   d) (a) and (c) are correct.

10- The scientist……. deduced that the cell is the functional and building unit of all living organisms.
   a) Robert Hooke b) Schleiden c) Virchow d) Van Leeuwenhoek

11- Which objective provides the greatest depth of field?

a) High b) low c) 100x d) this depends on if the specimen is stained

12- The contrasting power of light microscope is…….
a) High b) very high c) low d) very low

13- The scientist who made a microscope that had the power to magnifying objects up to 200 times of their real size was ……..
a) Robert Hooke b) Schleiden c) Virchow d) Van Leeuwenhoek

14- Magnifying power of light microscope reaches ……. time(s).
a) 500 b) 1500 c) 7000 d) one million

15- Scanning electron microscope helps us to……
a) See the inside of a sample.
b) See the atoms of the sample.
c) See the electrons of a sample.
d) See the texture of the sample.

16- The image that is formed by the electron microscope characterized by being……..
a) Highly magnified only.
b) Low magnified and contrasted.
c) Highly contrasted only.
d) Highly magnified and contrasted.

17- “All animals are made of cells”. This fact discovered by……
a) Matthias Schleiden.
b) Van Leeuwenhoek.
c) Rudolf Virchow.
d) Theodor Schwann.

18- A student wants to view cells under the microscope at a total magnification 400x. If the objective is 40x. Which of the following eyepiece lenses should be used?
a) 10x b) 40x c) 50x d) 100x

19- The cell can be one million times of its real size by using the……
a) Light microscope b) electron microscope c) centrifuge d) hand lens

20- Magnifying power of the electron microscope depends on the presence of……..
a) glass lenses b) plastic lenses c) electromagnetic lenses d) all the previous

21- Scanning electron microscope depends in its work on the presence of……

a) Natural light
b) Artificial light
c) A beam of electrons
d) All the previous

22- “All cells come from other pre-existing living cells”
“Cells are the basic functional unit of all living organisms”

Which statement is correct?

a) The two statements are from the principles of cell theory.
b) The two statements are not related to each other, but the second statement discovered by Schwann.
c) The two statements are from the principles of cell theory, where the first fact discovered by Virchow.
d) No correct answer.

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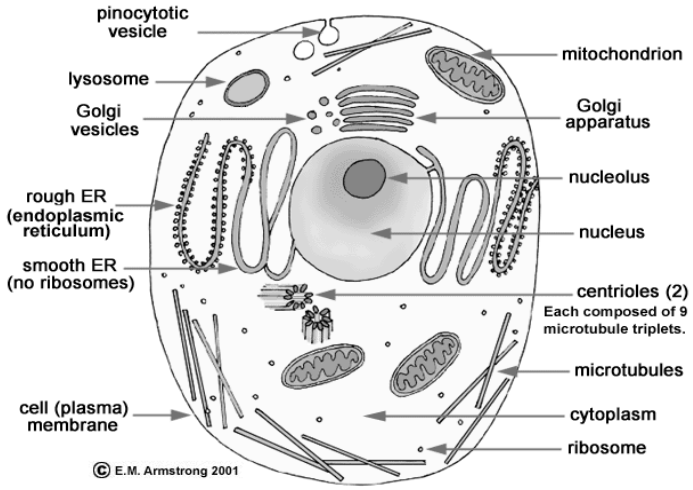
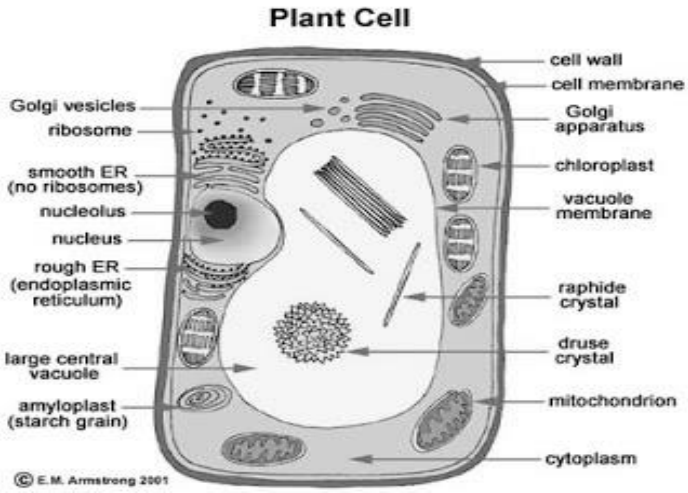
Lesson 2 The Cell ultra-structure

The structure of the cell





- The cell composed of a protoplasm which is composed of two different parts:

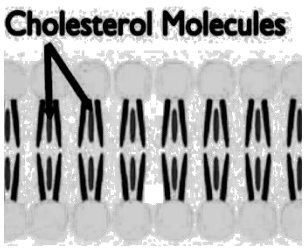
1. The cytoplasm.
2. The nucleus of the cell is surrounded by a plasma membrane.

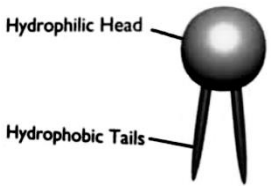
I.The cell wall:

- Found in plant cell, algae and some bacteria. Made up of **cellulose**
- Gives the cell its final shape and protects and supports it. permeable

II. Plasma Membranes :

- It surrounds all the cells (plants or animals)
- It is composed of phospholipid bi- layer. The hydrophilic heads (heads which can dissolve in water) of these molecules face the aqueous medium outside cell, while the hydrophobic tails (tails which cannot dissolve in water) exist inside.





- There is some protein molecules between the two layer of phospholipids which work as:-
  - Regulates the passages of the substances that enter and get out of the cell.
- Cell membrane is liquid (resembles oil in water) because the phospholipids are in a liquid state.

- There is some cholesterol molecules bound to phospholipids in cell membrane to keep the membrane cohesive.

III. The Nucleus:

- Largest in the cell.
- Its shape may be spherical or ellipsoidal.
- ***The Nuclear Membrane:*** Very thin double membrane tiny pores
- ***The Nucleoplasm:*** very clear fluid known as the nuclear sap, Contains some filaments coiled around each other called ***chromatins***.
- ***The Nucleolus:*** 1 or more spherical body in the nucleoplasm.
  - ***The Chromatin :*** form the chromosomes during Metaphase stage of cell division.

❖ ***Chromosomes:***

- It is formed of the nucleic acid ***DNA*** coiled around Histones proteins.
- Consist of 2 identical chromatids connected by ***centromere***, they carry genes.

❖ The number of chromosomes is constant in each species

Function of the nucleus:

1. It controls cell division process
2. It contains the nucleolus which is responsible for forming ribosomes (which synthesize proteins).

IV. The Cytoplasm:

- Jelly like fluid.
- Heterogeneous due to the presence of protoplasmic and non-protoplasmic constituents imbedded in it, thus it looks granular.

➢ Choose the correct answer:

1- Which structure of the following is instrumental in helping a cell to maintain its homeostasis?
   a) Cell wall b) nucleus c) cytoskeleton d) plasma membrane

2- The control center or brain of the cell is ……..
   a) Nucleus b) mitochondria c) endoplasmic reticulum d) cell membrane

3- Cell wall consists of……..
   a) Protein b) cellulose c) fats d) glycogen

4- The small particles that are found on the outer surface of endoplasmic reticulum in great numbers are the…….
   a) Centrosome b) cytoplasm c) ribosomes d) plastids

5- The term cytoskeleton includes……..
   a) Filaments b) microtubules c) ribosomes d) (a) and (b)

6- Cell is made up of a(an) ……..that is surrounded by the cell membrane.
   a) Protoplasm b) cytoplasm c) ectoplasm d) endoplasm

7- Cell protoplasm is differentiated into two major parts which are the……..
   a) Nucleus and Golgi apparatus.
   b) Cell membranes and cell walls
   c) Mitochondria and cytoplasm.
   d) Nucleus and cytoplasm.

8- Which structure regulates what enters and leaves the cell?
   a) Cell wall b) nucleus c) plasma membrane d) chromosome

9- From the non-membranous organelles in the cell is (are)……..
   a) Endoplasmic reticulum b) lysosomes c) Golgi bodies d) ribosomes

10- The point of connection between two chromatids is known as…….
   a) Chromosomes b) centrosome c) centromere d) centriole

11- Plasma membrane consists of……..
   a) One layer of phospholipids
   b) Two layers of phospholipids
   c) Two layers of chitin
   d) Two layers of cellulose

12- Which of the following organelles is less affected by the lipid solvents?
   a) Mitochondria b) plastid c) lysosome d) ribosome

13- All the following are from the membranous organelles in the cell except the ……

a) Endoplasmic reticulum b) Golgi body c) centrosome d) mitochondria

14- The ……is (are) the most obvious organelle(s) under the microscope.

a) Ribosomes b) nucleus c) endoplasmic reticulum d) lysosomes

15- Histone proteins are found in the……..

a) Centriole b) lysosome c) chromatin d) endoplasmic reticulum

16- The……is a structure inside the nucleus that is responsible for making ribosomes.

a) Nuclear envelope b) nucleoplasm c) nucleolus d) chromatin

17- The flexible barrier around the cell is called the……..

a) Nuclear envelope b) cell wall c) plasma membrane d) cytoskeleton

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Lesson 3 The Cell ultra-structure

Organelles	Structure and function
▪ **The Endoplasmic Reticulum (E.R):**	***It may be rough when it carries on its outer surface ribosomes (R.E.R).*** 1- Synthesizing proteins in cells. 2- Modifying proteins produced by ribosomes 3- Producing new membranes for cells ***In the absence of the ribosomes It appears smooth (S.E.R)*** 1- Synthesizing lipids in cells. 2- Changing carbohydrates into glycogen. 3- Changing the nature of some toxins to become less poisonous
●**The Ribosomes**	Non-membranous round organelles which synthesize proteins, They exist in two regions of the cell:- **1- In Cytoplasm:** They synthesize protein inside the cell **2- Attached to the external surface of endoplasmic reticulum:** More in number, they synthesize proteins which are send outside the cell through the inner endoplasmic reticulum
▪ **The Mitochondria**	▪ A sac-like membranous structure that exists in all cells, it is composed of:- **1- Inner membrane** includes folds called ***Cristae*** (to increase the surface area of the medium of chemical reactions) **2- Outer membrane** **Function of mitochondria** 1- It stores respiratory enzymes 2- It stores the energy resulted from respiration process in the form of ATP (Adenosine Triphosphate)
▪ **The Golgi apparatus**	• A group of flat membranous sacs with spherical ends. • It is found more in glands cells • In plants and algae, they are called "**Dictyosomes**. ***Function:*** It receives the substances produced by ER through transport vesicles, modify them, then use them inside the cell or expel them from cell in the form of secretions.

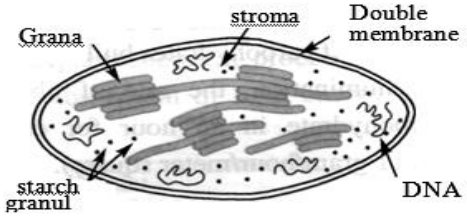
<table>
<tr><td>▪ The Centrosome</td><td>• It occurs in animal cell (except neuron) but not plant cells.
• It is formed of two particles known as centrioles.
<u>Function:</u>
• Formation of spindle fiber during cell devision.
• It forms cilia and flagella</td></tr>
<tr><td>▪ The Lysosomes</td><td>• Small spherical membranous vesicles formed by Golgi bodies, contain digestive enzymes
Function:-
1- Getting rid of old and destroyed cells or organelles.
2- Digestion of nutrients swallowed by cells (Cell is not affected by the enzymes of Lysosomes because their enzymes are separated from the other components of cell by a membrane.)GR</td></tr>
<tr><td>Cell Vacuoles:</td><td>▪ Small membranous sacs, they are many in animal cells and one large in plant cells.
Function: They store water, wastes and food till the cell use or get rid of them.</td></tr>
<tr><td>▪ The plastids (photo synthetic organelles):</td><td>• Found in plant cells.
<table>
<tr><th>Chloroplasts</th><th>Chromoplasts</th><th>Leucoplasts</th></tr>
<tr><td>They contain chlorophyll pigment which change the light energy of sun to chemical energy stored in glucose chemical bonds
They exist in Green leaves and stems of plant</td><td>They contain pigments called "<u>carotenoids</u>", their colours may be red, orange, or yellow.
They exist in Petals of flowers and fruits.
& Roots as radish</td><td>They are colorless plastids which don't contain any pigments.
They exist in Inner cauliflower leaves & Potato roots
Function: store starch</td></tr>
</table>
Structure of chloroplast:-
1- Inner membrane
2- Outer membrane
3- <u>Stroma</u>: An inner filling surrounded by a bi-layer membrane
4- <u>Granum</u>: Stacks of inner membranes in the form of disks.
 

Diagram of a chloroplast (highly magnified)</td></tr>
</table>

➢ Choose the correct answer:

1- The …….. work as centers for storing the starch.

a) Chloroplasts b) chromoplasts c) leucoplasts d) (b) and (c)

2- Green plastids in the plant cells are concerned with……..

a) Performing photosynthesis
b) Producing energy
c) Secreting protein
d) Storing excess food

3- The number of lysosomes increases in the …….

a) White blood cells b) skin cells c) muscles d) nerve cells

4- The organelle that is responsible for the formation of cell flagella is…….

a) Ribosome b) lysosome c) Golgi body d) centrosome

5- "Mitochondria are found in large numbers in the muscular cells"
"Mitochondria are responsible for the energy production in cells"

Which one of the following is correct about the two statements?

a) The two statements are correct and related
b) The two statements are correct and not related
c) The first statement is correct but the second is wrong
d) The first statement is wrong but the second is correct

6- The…….contain the remains and wastes of the cell.

a) Lysosomes b) vacuoles c) mitochondria d) plastids

7- All the following organelles are found in the animal cells, except……..

a) Centrosome b) mitochondria c) Golgi apparatus d) plastids

8- An organelle that acts on the production of substances containing atoms of carbon , hydrogen , oxygen and nitrogen is…….

a) Lysosome b) ribosome c) Golgi body d) endoplasmic reticulum

9- All the following organelles have a role in the production of proteins inside the cell except……..

a- Lysosomes b) ribosomes c) Golgi bodies d) endoplasmic reticulum

10- Endoplasmic reticulum participates in all the following functions except……..

a) Production of energy
b) Formation of cell secretion
c) Protein synthesis
d) Connection between cell parts

11- Lysosomes contain……..

a) Respiratory enzymes b) cell secretions c) digestive enzymes d) cellulose

12- A minute body found in most animal cells and some cells of fungi and plays a role in cell division is the……

a) Centromere b) chromatin c) centrosome d) lysosome

13- From the organelles that are found in the plant cells, algae and most fungi is(are)……

a) Ribosomes b) plastids c) mitochondria d) centrosome

14- From the cell organelles that present in great numbers in the cells with secreting activity is(are)……..

a) Lysosomes b) centrosome c) Golgi bodies d) ribosomes

15- The smooth endoplasmic reticulum is present in the cells of……..

a) Stomach b) intestine c) endocrine glands d) liver

16- An organelle that is responsible for synthesizing compounds participating in the biochemical process that keep the life and its continuity……..

a) Ribosome b) centrosome c) Golgi body d) endoplasmic reticulum

17- From the cell organelles that depend in their work on the presence of transporting and secretory vesicles is(are) ……

a) Ribosomes b) Golgi body c) lysosomes d) endoplasmic reticulum

18- All the following structures are membranous organelles, which one of them has a single membrane?

a) Green plastid b) endoplasmic reticulum c) mitochondrion d) lysosome

19- The organelle which is found in the plant and animal cells is……..

a) Ribosome b) plastid c) centrosome d) cell wall

20- If a living cell from another planet instead of Earth that doesn’t contain oxygen, which one of these organelles is absent from this cell?

a) Cell membrane b) nucleus c) ribosomes d) mitochondria

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Lesson 4 The Plant Tissues

1. Simple tissues:

A) Parenchyma tissue	B) Collenchyma tissue	C)Sclerenchyma tissue
• A living tissue with thin and flexible walls. They may be coloured, green or colorless. • They have spaces between the cells for aeration • contains one or more vacuoles filled with water & mineral salts. **Function:-** 1- Photosynthesis 2- Storing nutrients such as starch 3- Aeration.	• A living tissue • its walls are irregularly thickened with cellulose. **Function:** 1.Supporting the plant 2.Give flexibility.	A non-living tissue, There walls are thickened by Lignin. **Function:** 1.Supports the plant 2.Gives flexibility and solidity

2. The Compound Tissues.

Phloem	Xylem
Consists of: sieve tubes, companion cells. **A. The sieve tubes**: - Cylindrical shape. - transverse walls (Sieve plate) have pores for the cytoplasm strands to pass . - Has no nuclei. **B. Companion cell**: - Contact with each sieve element has a nucleus, gives energy to sieve tube **function**: transport of food from leaves to other parts of the plant	**Consists of**: tracheids and the wood vessels, parenchyma **A) Tracheids**: - The walls covered by lignin. - Have no cytoplasm or nucleus - Arranged over each other **B) Wood vessels**. - The walls covered by lignin. - Have no transverse walls between cells - Long wide tube is formed so water and salts can pass easily and quickly **function**:1.Translocationof water and salts 2. Support the plant.

❖ Choose the correct answer:

1- What is the correct ascending order of the body structure?
   a) Heart – Neuron – Blood
   b) Neuron – Blood – Heart
   c) Blood – Neuron – Heart
   d) Heart – Blood – Neuron

2- The……..is a simple plant tissue whose cells are thickened by lignin.
   a) Parenchyma b) collenchyma c) chlorenchyma d) sclerenchyma

3- Xylem tissue transports……
   a) Water b) salts c) water & salts d) organic substances

4- From the plant conductive tissues are…….tissues.
   a) Collenchyma & xylem
   b) Parenchyma & phloem
   c) Xylem & phloem
   d) Collenchyma & Parenchyma

5- Xylem tissue is thickened with…….substance.
   a) Cellulose b) pectin c) lignin d) suberin

6- The tissue that is responsible for aeration in the cells is the……..tissue.
   a) Collenchyma b) Parenchyma c) xylem d) sclerenchyma

7- From the examples of plant vascular tissue is……tissue.
   a) Collenchyma b) Parenchyma c) xylem d) sclerenchyma

8- From the functions of parenchyma tissues is…….
   a) Performing photosynthesis process
   b) Aeration
   c) Storing some starchy substances
   d) All the previous

9- The tissue that is responsible for transporting water and salts from the roots to leaves is……tissue.
   a) Collenchyma b) parenchyma c) phloem d) xylem

10- Which of the following contains a nucleus?
   a) Vessels b) Tracheids c) companion cells d) sieve tubes

11- From the tissues that work on supporting the plant are……tissues.

a) Parenchyma and collenchyma
b) Parenchyma and sclerenchyma
c) Collenchyma and sclerenchyma
d) Parenchyma and xylem

12- All the following are from components of xylem tissue except…….

a) Vessels b) parenchyma cells c) tracheids d) fibers

13- Phloem transports……to all the plant parts.

a) Nutrients b) water c) salts d) water & salts

14- From the types of plastids that are found in the parenchyma tissue are……..

a) Leucoplasts b) chloroplasts c) chromoplasts d) all the previous

15- In plant, what is formed of xylem vessels?

a) A cell b) A tissue c) an organ d) an organ system

16- From the compound plant tissues is……..tissue.

a) Collenchyma b) xylem c) parenchyma d) sclerenchyma

17- Tissue forming long flexible and strong strands in leaf stalks is……..

a) Sclerenchyma b) tracheids c) collenchyma d) parenchyma

18- All the following cells whose walls are thickened by lignin, except……

a) Tracheid cells b) collenchyma cells c) xylem vessels d) sclerenchyma cells

19- The sieve tubes are……

a) Polygonal cells that have a nucleus and their walls are thickened.
b) Round-shaped cells that have intercellular spaces.
c) Cylindrical cells whose separating walls are perforated and have no nucleus.
d) All the previous.

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Lesson 5 The Animal Tissues

1- Epithelial tissues

They cover the surface of body or line its cavity, have a little intracellular space.

There are two types of epithelial tissues, which are:-

1- Simple epithelial tissues

Their cells are ordered in one layer, for example:-

1- Simple squamous epithelial tissue: It is composed of one layer of flat cells

Examples: Capillary linings – The walls of air alveoli in lungs

2- Simple cuboidal epithelial tissue: It is composed of one layer of cuboidal cells.

Examples: The lining of kidney tubules.

3- Simple columnar epithelial tissue: Composed of one layer of columnar cells.

Examples: The lining or stomach and intestine

2- Complex (stratified) epithelial tissue

Its cells are arranged in many layers

3. Stratified squamous epithelial tissue:

It is composed of many layers or arranged cells above each other, the upper layer is squamous. Example: Skin

The functions of epithelial tissues:-

They perform different functions according to their locations, such as:-

- Absorbing water and digested food as in the lining of small intestine.
- Protecting the cells, they cover from dryness and harms as in skin
- Secreting mucus to keep the cavity soft and moist as in air trachea and digestive canal

2- Connective tissues

They are composed of relatively distant cells, the intracellular spaces between them are filled by liquid, semi-solid, or solid substances.

Connective tissues are classified according to the type of intracellular material into:-

1- Proper connective tissues:

The most common type, it has a medium degree of solidity and high flexibility .
Function: Connecting tissues and different organs with each other.
Example: Under skin – Peritoneum (in small intestine)

2- <u>Skeletal connective tissue:</u>
It has solid intracellular substance (in bones, calcium is precipitated in it)
Examples: Bones – Cartilages
Function: Supporting the body

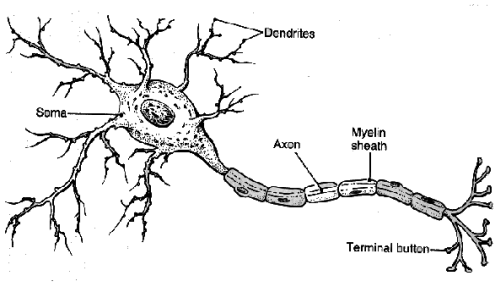
3- <u>Vascular connective tissue:</u>
It has liquid intracellular substance.
Function: Transporting digested food, gases and execrations.
Examples: Blood – Lymph

<u>3- Muscular tissues</u>
They have the ability to contract and relax, which enable living organisms to move.
There are three kinds of muscular tissues, which are:-
<u>1- Smooth muscles:</u> They are composed of involuntary non-striated muscles fibers.
Examples: They exist in the wall of digestive canal, urinary system, and blood vessels

<u>2- Skeletal muscles:</u> They are composed of striated voluntary muscles; they are usually found attached to the skeleton.
Example: The muscles of hands, legs and stem

<u>3- Cardiac muscles:</u> They are composed of striated involuntary muscles; they are found in the walls of heart only. Cardiac muscles contain <u>intercalated disks</u> which are attached to muscle fibers, they make heart pump blood regularly.

<u>4- Nervous tissues</u>
They are responsible for regulating the different functions or body organs because:-
They receive sensory stimuli inside or outside the body and send them to the brain and spinal cord. Then, it sends movement orders to responding organs.



➢ Choose the correct answer:

1- The skeletal muscles are……..
   a) Voluntary b) striated c) involuntary d) (a) and (b)

2- The tissue that connects the body tissues and organs with each other is the……..
   a) Stratified epithelial tissue
   b) Skeletal connective tissue
   c) Connective tissue proper
   d) Muscular tissue

3- The……..tissue is a simple epithelial tissue that presents in the lining of lung alveoli.
   a) Simple cuboidal b) simple squamous c) simple columnar d) all the previous

4- Stem cells can be removed from…….stage of human development.
   a) Egg b) zygote c) sperm d) embryo

5- Nerve cells help in ……
   a) Regulating the different activities of the body organs
   b) Receiving mucous from epithelial cells
   c) Controlling the heart beats
   d) Connecting muscle fibers together

6- Vascular connective tissue includes……
   a) Bones and cartilages
   b) Blood and lymph
   c) Blood capillaries and alveoli
   d) Blood and cartilages

7- Stem cells could be used to cure paralysis. Which type of cell would they need to become?
   a) Heart b) liver c) kidney d) nerve

8- The tissue that transports the digested food, gases and excretory substances is the……
   a) Connective tissue proper
   b) Vascular connective tissue
   c) Skeletal connective tissue
   d) Compound epithelial tissue

9- The…….tissue is present in the kidney tubules.
   a) Stratified epithelial b) simple cuboidal c) simple columnar d) connective proper

10- The intercellular substance of the vascular connective tissue is…….
   a) Solid b) fluid c) semi-fluid d) semi-solid

11- On moving the head and limbs, the……..muscles move.

a) Skeletal b) smooth c) involuntary d) cardiac

12- A human stem cell can develop into…….

a) Any type of human cells
b) Stomach cells only
c) Nerve cells only
d) Some cells

13- The……tissue is present in the lining of stomach and intestine.

a) Stratified epithelial b) simple cuboidal c) simple columnar d) simple squamous

14- The……tissues are characterized by their ability of contraction and relaxation.

a) Nervous b) muscular c) connective d) epithelial

15- From the functions of epithelial tissue is……..

a) Absorbing the digested food
b) Protecting the cells
c) Secreting mucous
d) All the previous

16- The intercellular substance of the vascular connective tissue is…….

a) Solid b) semi-solid c) fluid d) semi-fluid

17- The smooth muscle fibers are found in the wall of ……..

a) Digestive canal b) blood vessels c) urinary bladder d) all the previous

18- The……tissue secretes mucous as in the alimentary canal and trachea.

a) Connective b) epithelial c) muscular d) nervous

19- The human heart muscles are……

a) Striated voluntary
b) striated involuntary
c) unstriated involuntary
d) unstriated voluntary

20- Cells that move organs and body parts, where they are elongated and filled with contractile filaments. So they can move bones or change the size internal organs are……..

a) Skeletal connective tissue cells
b) Smooth muscular cells
c) Skeletal muscular cells
d) (b) and (c)